

Guidelines for Measurement of Standby Power Use

In Response to Executive Order 13221

Version ~~April 29, 2002~~ April 22, 2002

Introduction

These Guidelines have been developed to support Executive Order 13221 related to “Energy Efficient Standby Power Devices.”

Please note that products covered by Energy Star standby specifications may be tested by those procedures and the results will be honored in lieu of the guidelines presented below.

Procedures for declaring the representative standby power value for a specific model are given in the submission forms.

1 Scope

This Guideline specifies methods of measurement of electrical power consumption in the standby mode. It is applicable to mains-powered electrical devices. However, it is limited to devices where the consumer is expected to connect the device to the mains with a standard plug at a standard outlet.

Note – This Guideline does not apply to “hard-wired” devices, such as smoke alarms.

This Guideline does not specify safety requirements. It does not specify minimum performance requirements nor does it set maximum limits on power or energy consumption.

This Guideline describes the measurement procedures for a single device.

2 Definitions

For the purpose of this Guideline the following definitions apply.

2.1 Standby mode

The lowest power consumption condition when the Equipment Under Test (EUT) is connected to the mains electricity supply and used in accordance with the manufacturer’s instructions.

Standby power is expressed in Watts.

An EUT with an integrated switch that completely disconnects the device from mains power will be considered to have zero standby power.

Note – Some devices may have an “off” or “power” switch, but continue to use power when switched “off.”

Note – A separable “power strip” is not considered an integrated switch.

Note - The standby mode should not be confused with “sleep” mode or other reduced power modes that may be automatically initiated by the EUT. The standby mode is generally different (and consumes less power than self-initiated modes). Certain devices are not equipped with power switches but employ sleep modes to reduce power use during periods of inactivity. For these devices, the standby and sleep modes are the same.

2.2 Portable EUT

An EUT is considered “portable” if it can provide services while disconnected from mains electricity. A portable EUT typically consists of a station that plugs into mains electricity and a detachable, portable part.

Note – Examples of portable devices are: cordless telephones, rechargeable mobile telephones (or cellular phones), laptop and notebook computers, and battery-operated, rechargeable tools.

3 General conditions for measurements

3.1 General

Unless otherwise specified in the test report, the measurements shall be made under the following conditions:

3.2 Test room

The tests shall be carried out in room that has an air speed close to the appliance under test of 0.5 m/s. The ambient temperature shall be maintained at $(20 \pm 5) ^\circ\text{C}$ throughout the test.

3.3 Power supply

The EUT shall be supplied at 115 Volts AC or 230 Volts AC and 60 Hertz frequency, whichever is closer to the specifications for the normal operation of the EUT. The tests shall be carried out at the specified voltage $\pm 1\%$ and the specified frequency $\pm 1\%$.

Any departures from these values shall be stated in the report.

3.4 Supply voltage waveform

The total harmonic content of the supply voltage shall not exceed 5% (up to and including the 13th harmonic); harmonic content is defined as the root-mean-square (r.m.s.) summation of the individual components using the fundamental as 100%.

3.5 Measurement uncertainty and instrumentation accuracy

Power measurements shall be made with a meter capable of a resolution of less than 0.1 W at 1.0 W actual power consumption and accumulate into Watt-hours at a minimum power level of 20 milliwatts. The measurement period shall be no less than five minutes and as long as needed to achieve a resolution of ± 0.1 W in the calculation of average power use.

Instruments shall be capable of operating within their stated tolerances for input voltages at up to 5% Total Harmonic Distortion and shall be capable of operating at frequencies from 47 through 63 Hz.

Power measurement instruments shall have a crest factor of not less than 5 at RMS currents of 2 amps or less.

Time measurements for each monitoring period shall be accurate to within 2 seconds.

4 Measurements

4.1 General

The purpose of this test method is the determination of the average power consumption in standby mode. The goal is to measure the energy consumption over a period of not less than 5 minutes and long enough to assure sufficient resolution in the calculation of average power.

Where the mode changes automatically, it may be necessary to operate a product through the automatic sequence several times on a trial basis to ensure that sequence is fully understood and documented before test results are recorded and reported.

Note - Some EUTs may enter a higher power state immediately after they are switched off (or after the power is first connected) before dropping back to their standby state. Some may delay their return to their standby state in “off” mode after they have finished a program or when switched to “off”

4.2 Selection and preparation of EUT

The EUT shall be prepared and set up in accordance with the manufacturer’s instructions, except where these conflict with the requirements of this test. If no instructions are given, then factory settings shall be used.

4.3 Procedure

4.3.1 Measurement procedure

Connect the EUT to the energy/power metering equipment. Select the conditions necessary to achieve operation in the standby mode. Monitor the power consumption but allow the EUT to stabilize for not less than 5 minutes. Commence energy consumption readings for a period of not less than a further 5 minutes, checking the power and equipment during the recording period to make sure that the EUT has not entered another mode. Continue measurement until the necessary measurement period is complete.

Note - Even when the EUT is in the standby mode, the instantaneous power readings may vary by a small amount during the recording period or the EUT may draw an energy pulse at regular intervals. These variations will be averaged by measuring the energy consumption over the monitoring period.

4.3.2 Measurement procedure for portable EUTs

The standby mode for a portable EUT is the lowest power requirement of the part of the EUT that is connected to mains power with the portable part detached. The measurement procedure is otherwise the same as described in 4.3.1.

Note – Cordless telephones should be tested according to the Energy Star test procedure, that is, with the handset connected to the station.

5 Evaluation

Calculate the average standby power by dividing the measured energy consumption by the duration of the measurement.

The duration of the measurement will depend on the resolution of the metering equipment.

Example – The minimum testing period (in minutes) is given by the following formula:

Minimum duration (in minutes) = [meter resolution (Wh) / required accuracy (W)] x 60 (min/h)

If the meter has a resolution of 0.01 Wh and the required accuracy is 0.1 W, then the minimum metering period is $[(0.01/0.1) \times 60] = 6$ minutes.

The average power data shall be reported in Watts rounded to the nearest 0.1W.

6 Test report

The following information shall be recorded in the test report:

6.1 EUT details:

- Manufacturer, brand, model, type, and serial number.
- description, *as appropriate*
- rated voltage and frequency range

6.2 Test Parameters

- ambient temperature (°C).
- test voltage (V) and frequency (Hz).
- total harmonic distortion of the electricity supply system
- information and documentation on the instrumentation, set-up and circuits used for electrical testing.

6.3 Measured data, for the standby mode:

- average power in Watts
- period of measurement (minutes)
- description of how the standby mode was achieved
- any notes regarding the operation of the EUT, including settings of software parameters and hardware switches that influence standby power use

6.4 Test and Laboratory Details

- test report number/reference
- date of test
- laboratory name and address
- test officer